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EMPIRICAL MODELING OF NIGHTTIME EASTERLY AND WESTERLY  
VLF PROPAGATION IN THE EARTH-IONOSPHERE WAVEGUIDE(U)  
NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA  
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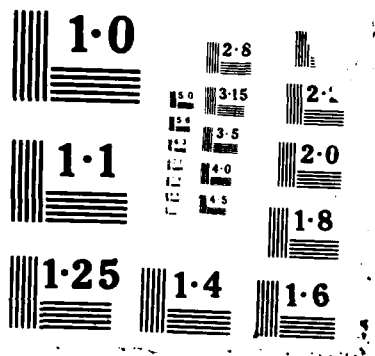
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<p>It has been known for many years that easterly and westerly propagation of VLF in the earth-ionosphere waveguide is nonreciprocal with the mean attenuation rate to the west being greater than to the east for ground to ground transmissions. It is also true that nighttime propagation to the west is more difficult to predict than is propagation to the east. For example, a simple exponential <math>\beta = 0.5 \text{ km}^{-1}</math>, <math>h' = 87 \text{ km}</math> (notation of Wait and Spies) profile does an excellent job of predicting nocturnal in-flight measurements over the Hawaii-San Diego path but does not predict nighttime propagation over the Hawaii-Wake path. This is partly due to the fact that propagation to the west is less stable than propagation to the east. In this study full wave solutions will be used to show that propagation to the west is more sensitive to upper levels of the ionosphere than is propagation to the east. It therefore seems reasonable that propagation to the west senses more variable regions of the ionosphere than does propagation to the east and that this, at least in part, is responsible for the difficulty of predicting westerly propagation. Comparisons are made between calculations based on empirical electron density profiles and in-flight measurements between Hawaii and San Diego, and Hawaii and Wake.</p> <p>Presented at Fifth International Ionospheric Effects Symposium, Springfield, VA, 5-7 May 1987 and URSI, Boulder, CO, 12-15 Jan 1987.</p>			
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EMPIRICAL MODELING OF NIGHTTIME EASTERLY AND WESTERLY VLF  
PROPAGATION IN THE EARTH-IONOSPHERE WAVEGUIDE

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ABSTRACT



It has been known for many years that easterly and westerly propagation of VLF in the earth-ionosphere waveguide is nonreciprocal with the mean attenuation rate to the west being greater than to the east for ground to ground transmissions. It is also true that nighttime propagation to the west is more difficult to predict than is propagation to the east. For example, a simple exponential  $\beta=0.5\text{km}^{-1}$ ,  $h'=87\text{km}$  (notation of Wait and Spies) profile does an excellent job of predicting nocturnal in-flight measurements over the Hawaii-San Diego path but does not predict nighttime propagation over the Hawaii-Wake path. This is partly due to the fact that propagation to the west is less stable than propagation to the east. In this study full wave solutions will be used to show that propagation to the west is more sensitive to upper levels of the ionosphere than is propagation to the east. It therefore seems reasonable that propagation to the west senses more variable regions of the ionosphere than does propagation to the east and that this, at least in part, is responsible for the difficulty of predicting westerly propagation. Comparisons are made between calculations based on empirical electron density profiles and in-flight measurements between Hawaii and San Diego, and Hawaii and Wake.

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